CLAIMS

1. A method for the cutting of thick sections of cement-based materials, the method comprising the steps of: mutually traversing a surface to be cut with a laser beam at a power density such as to produce a depth of molten material of a maximum of 10mm at each traverse; allowing said molten material to solidify; breaking said solidified material into particles; and, removing said particles by suction means.
2. A method according to claim 1 and comprising a plurality of traverses along substantially the same cutting path.
3. A method according to either claim 1 or claim 2 wherein the laser beam is unfocused.
4. A method according to claim 3 wherein the laser beam is a parallel beam.
5. A method according to claim 4 wherein the laser beam has a rectangular cross section.
6. A method according to any one preceding claim wherein the re-solidified molten material is removed directly after solidification after each pass.
7. A method according to any one preceding claim wherein the re-solidified material is broken up by a hollow crushing tube which also serves as a material extractor conduit.
8. A method according to any one preceding claim wherein the depth of the molten material at each pass lies in the range from 0.5 to 5mm.
9. A method according to claim 8 wherein the depth of molten material lies in the range from 1 to 4mm.
10. A method according to claim 9 wherein the depth of molten material lies in the range from 1 to 2mm.
11. A method according to any one preceding claim wherein the pressure required for crushing the re-solidified material is less than 100MPa.
12. A method according to any one preceding claim wherein the laser power density lies in the range $300W.cm^{-2}$ to $12000W.cm^{-2}$.
13. A method according to any one preceding claim wherein the beam traverse speed lies between $3cm.min^{-1}$ and $40cm.min^{-1}$.

14. A method according to any one preceding claim wherein an oxygen jet is applied directly at the beam spot when reinforcing steel bars are being cut.

15. A method according to any one preceding claim wherein the surface temperature of the material being treated lies in the range 700°C to 2400°C.

16. A method wherein the vapour-to-melt ratio lies in the range between 0.05 and 3.

17. A method according to any one preceding claim wherein the material removal rate lies in the region of 150 $cm^{-3}.kWh^{-1}$ for a diode laser and 100 $cm^{-3}.kWh^{-1}$ for a CO_2 laser.

18. A method according to any one preceding claim wherein the laser is selected from a CO_2 or diode laser.

19. A method according to any one preceding claim from 1 to 17 wherein the laser is selected from one of: Nd:YAG, diode, or COIL type lasers.

20. A method according to claim 19 wherein the laser beam is delivered by a fibre optic cable.

21. A method according to any one preceding claim wherein the laser beam is delivered by a mobile beam delivery system comprising a system of reflecting mirrors.

22. Apparatus for the cutting of thick sections of cement-based materials by the method claimed in any preceding claim, said apparatus comprising means for mutually traversing a surface to be cut with an unfocused laser beam at a power density sufficient to produce a depth of molten material of a maximum of 10mm at each traverse; means for breaking melted and re-solidified material into particles; and, means for removing said particles by suction means.

23. Apparatus according to claim 22 wherein the means for breaking re-solidified material comprises a percussive member for crushing the material.

24. Apparatus according to claim 23 wherein the percussive member is hollow and crushed material is removed through the member by suction means.

25. Apparatus according to any one of preceding claims 22 to 24 wherein the laser beam is substantially parallel.

26. Apparatus according to any one of preceding claims 22 to 25 wherein the laser beam has a circular cross section.

27. Apparatus according to any one of preceding claims 22 to 25 wherein the laser beam is rectangular in cross section.